MGM UNIVERSITY

SYNOPSIS

"NEW MEDIA AND HEALTH – A CRITICAL STUDY ON THE USE OF SMARTPHONE AMONG UNDERGRADUATE STUDENTS OF MARATHWADA REGION AND ITS IMPACT ON THEIR HEALTH"

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Title of Ph.D Thesis:

New media and Health – A Critical Study on the Use of Smartphone among undergraduate students of Marathwada region and its impact on their health

Objectives

- To assess the smartphone usage among undergraduate students.
- To assess the impact of smartphone on physical health of undergraduate students.
- To assess the impact of smartphone on mental health of undergraduate students.
- To determine correlation between level of smartphone addiction and mental health among undergraduate students.
- To find association between level of smartphone addiction and demographic variables.
- To find association between level of mental health and demographic variables.

TABLE OF CONTENTS

SI. NO	CONTENT	PAGE NO.
1.	ABSTRACT	3
2.	INTRODUCTION	3 – 6
3.	REVIEW OF LITERATURE	6 – 12
4.	THERIOTICAL FRAMEWORK	12
5.	RESEARCH METHODOLOGY	13 – 15
6.	FINDINGS	15 – 30
7.	DISCUSSION	30 – 33
8.	RECOMMENDATIONS	33
9.	CONCLUSION	33
10.	FUTURE RESEARCH DIRECTIONS	33
11.	REFERENCES	35 – 36

New media and Health – A Critical Study on the Use of Smartphone among undergraduate students of Marathwada region and its impact on their health

Abstract

In the age of technological advancement, smartphones have emerged as powerful tools, seamlessly integrating into various facets of daily life. Particularly among university students, smartphones serve as an essential medium for communication, academic engagement, and social interaction. However, while these devices offer unprecedented convenience and connectivity, there is growing concern over the phenomenon of "smartphone addiction". The present study aimed to assess the use of smartphone among the undergraduate students of the Marathwada region and its impact on their health. Descriptive design was used for this study. The study was carried out in selected engineering colleges of Marathwada region. The sample comprised of 600 final year engineering undergraduate students. The study findings revealed that, maximum 440 (73.3%) belong to 20 - 22 years of age group, 335 (55.8%) were males, 309 (51.5%) live with parents/guardian. Results also depicted that, maximum 348 (58%) had potential smart phone addiction, 414 (69%) had poor mental health. Smart phone usage also affected on physical health of the participants. There was positive correlation found between level of mental health and smartphone addiction score. There was significant association found between smartphone addiction scale score and selected demographic variables. The study concluded that, smartphone usage affected physical and mental health of the university students.

1. Introduction

The widespread adoption of smartphones has significantly altered the landscape of communication, learning, and entertainment, particularly among undergraduate students. These devices offer unparalleled convenience and functionality, making them indispensable tools for academic and social activities. However, the pervasive use of smartphones has also raised concerns about their potential impact on the health and well-being of students. This chapter explores the various ways in which smartphone usage influences the physical, mental, and emotional health of undergraduate students. By examining usage patterns and associated health outcomes, this study aims to shed light on the potential risks of using smartphones and its impact on the overall health of undergraduate students with smartphone dependency in this demographic. Understanding these impacts is crucial for developing strategies to promote healthier usage habits and mitigate adverse health effects, thereby enhancing the overall well-being of undergraduate students.

This study is inspired by the need to understand how smartphone addiction influences the holistic health of university students, encompassing physical, mental, social, and spiritual dimensions. With smartphone usage deeply ingrained in academic and social environments, this research aims to explore the fine line between productive and detrimental smartphone use. By examining these impacts within a sample of Indian university students, this study seeks to contribute valuable insights into how technology can affect well-being, offering a balanced perspective on an issue of global relevance.

1.1 Background

A smartphone (or simply a phone) is a portable computer device that combines mobile telephone functions and personal computing functions into one unit The major smartphone brands have quickly penetrated their way into the Indian mobile market, and now, over 500 million Indians are using smartphones.

The smartphone users in India are expected to reach 760 million in the year 2021 and this number is constantly rising. It will substantially increase in the next few years. 2019 saw a 15% increase in smartphone users in India. This number crossed 500 million billion. By 2040, it is projected that India will have 1.55 billion smartphone users[1]. That is an impressive growth considering India's population and the increasing adoption of mobile technology. According to a survey conducted in 2019, the highest penetration rate in the use of smartphones was for the age group of 18 to 24 years, with 37%. With over half of India's population online, and the number of internet users on the rise, social media has become one of the most popular ways to connect with friends, family, business contacts, and potential clients or customers. Importantly, social media has served as a melting pot of ideas of all kinds, giving a voice to those who were ignored in the past.

With almost every individual having access to at least one social media platform, it's easy to see why social media marketing is an attractive option for businesses big and small alike. But not all platforms are alike, and India has its own unique set of social media trends that can help to connect with audience or potential customers.

In 2023, the most popular social media platforms (including messaging apps) in India are WhatsApp, with 531.46 million active users, followed by Instagram with 516.92 million users, Facebook with 492.70 million users, Telegram with 384.06 million users, and Facebook Messenger with 343.92 million users. These platforms have become an integral part of the Indian digital ecosystem and are used by individuals and businesses alike for various purposes such as communication, marketing, and entertainment.

Excessive use of smartphones can lead to poor quality of life, particularly among adolescents. It has a significant impact on sleep quality and health-related behaviors. Studies have indicated that better health-related behaviors, such as nutritional behavior, self-actualization, interpersonal support, and stress management, are associated with improved sleep quality. Moreover, the degree of smartphone dependence and overall Health-Promoting Lifestyle Profile (HPLP) score are predictors of sleep quality. Therefore, reducing smartphone dependence and adopting healthy behaviors can significantly improve an individual's sleep quality.

Scope of the Study

This study focuses on understanding the impact of smartphone usage on the health of engineering undergraduate students in Marathwada region of Maharashtra, examining smartphone usage and dimensions of health: physical & mental. The target population consists of engineering undergraduate across selected engineering colleges of Marathwada region in Maharashtra, capturing a diverse range of students in terms of age, gender and socioeconomic background.

Data will be collected using a structured questionnaire, allowing for a comprehensive assessment of smartphone addiction levels and their correlations with health indicators within the defined scope. This study will focus on the current prevalence of smartphone addiction, the variations based on demographic factors, and the specific ways in which addiction impacts physical and mental health. By providing insights into how smartphone usage influences the well-being of students in a rapidly digitizing society, this research aims to contribute valuable insight that can inform educators, healthcare providers, and policymakers.

1.2 Research problem

New media and Health – A Critical Study on the Use of Smartphone among undergraduate students of Marathwada region and its impact on their health

1.3 Objectives of the study

- To assess the smartphone usage among undergraduate students.
- To assess the impact of smartphone on physical health of undergraduate students.
- To assess the impact of smartphone on mental health of undergraduate students.
- To determine correlation between level of smartphone addiction and mental health among undergraduate students.
- To find association between level of smartphone addiction and demographic variables.

- To find association between level of mental health and demographic variables.

1.4 Hypotheses:

- **H_{01}.** There is no smartphone addiction among undergraduate students.
- **H_{02}.** Excessive smartphone use not affects the physical health of undergraduate students.
- **H_{03}.** Excessive smartphone use not affects the mental health of undergraduate students.
- **H_{04}.** There is no significant correlation between level of smartphone addiction and mental health among undergraduate students.
- **H_{05}.** There is no significant association between level of smartphone addiction and demographic variables.

2. Literature Review

Review of literature is a fundamental step in the making process of research projects. Empower the researcher to create desired perception into the study and blueprint the methodology. It creates a foundation for subsequent study, support. The need for replication gives information about different constraints in collecting data. Review avails to co-relate between two studies with an intention to create a comprehensive body of scientific knowledge in discipline way to provide efficient and pertinent theories.

A study conducted by multiple universities and published in the Journal of Family Medicine and Primary Care in July 2020, investigated the correlation between health and daily activities among university students in Saudi Arabia. The research discovered that excessive use of smartphones can negatively impact sleep quality, which is essential for maintaining good health. Sleep plays a crucial role in immune and endocrine function, emotional and mood regulation, neuroplasticity, learning, practical skills like communication, cognition, emotional stability, and occupational performance. It is important to prioritize good sleep quality as poor sleep can result in physical fatigue, confusion, and lack of motivation. Lack of sleep can lead to lactic acid buildup, causing muscle cramps and pain as there is not enough time for muscle fatigue repair. Fatigue and impaired concentration can negatively impact occupational performance and overall quality of life.

A study was carried out a review of observational studies that consider links between mobile phone use and mental health from a psychological or behavioral

perspective. Systematic literature searches in PubMed and PsycINFO for articles published until 2017 were done. A total of 4738 papers were screened by title and abstract, 404 were retrieved in full text, and 290 were included. Only 5% had any longitudinal design. Self-reporting was the dominating method of measurement. One third of the studies included children or youth. A majority of adult populations consisted of university students and/or self-selected participants. The main research results included associations between frequent mobile phone use and mental health outcomes, such as depressive symptoms and sleep problems. Mobile phone use at bedtime was associated with, e.g., shorter sleep duration and lower sleep quality. “Problematic use” (dependency) was associated with several negative outcomes. In conclusion, associations between mobile phone use and adverse mental health outcomes are found in studies that take a psychological or behavioral perspective on the exposure.

A study was conducted to evaluate relationship between depression, smartphone addiction, and sleep among Chinese engineering students during the COVID-19 pandemic. Using a multistage stratified random sampling method, a cross-sectional survey was conducted among 692 engineering undergraduates from a top engineering university in China, and data were collected by self-reported electronic questionnaires. The data included demographic characteristics, such as age, gender, the Smartphone Addiction Scale-Short Version (SAS-SV), the 9-item Patient Health Questionnaire, and the Pittsburgh Sleep Quality Index. Results depicts that, the rate of smartphone addiction was 63.58%, with 56.21% for women and 65.68% for men, among 692 engineering students. The prevalence of depression among students was 14.16 %, with 17.65% for women, and 13.18% for men. Smartphone addiction was positively correlated with depression, and sleep played a significant mediating effect between the two, accounting for 42.22% of the total effect. The mediating effect of sleep latency was 0.014 [$P < 0.01$; 95% confidence interval (CI): 0.006-0.027], the mediating effect of sleep disturbances was 0.022 ($P < 0.01$; 95%CI: 0.011-0.040), and the mediating effect of daytime dysfunction was 0.040 ($P < 0.01$; 95%CI: 0.024-0.059). The influence of sleep latency, sleep disturbances, and daytime dysfunction accounted for 18.42%, 28.95%, and 52.63% of the total mediating effect, respectively. The results of the study conclude that reducing excessive smartphone use and improving sleep quality can help alleviate depression.

A study examined antecedents and possible consequences of smartphone use disorder (SmUD) among smartphone users. Study aimed to increase the understanding

of the interplay of SmUD, mental health and physical symptoms. Studies found that SmUD is associated with diverse psychological and physical health impairments, ranging from depression and anxiety to headaches and sleep disturbances. A cross-sectional random-quota online survey conducted among 938 German smartphone owners aged 14 to 64 years. An instrument based on the 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) was used to measure SmUD severity. The data was analyzed using structural equation modeling. Results revealed that, a rate of 4.0% potentially disordered users. Males and younger participants showed more signs of SmUD. As expected, SmUD severity was found to be associated with physical (more frequent headaches, sleep disturbances, gastrointestinal problems) as well as psychological (higher levels of loneliness, stress, depression/anxiety) health impairments. Overall results confirm that increased SmUD severity is associated with mental problems as well as with somatic symptoms. SmUD prevention and intervention programs should follow a broad approach that considers decreases in physical and mental health, possibly causing or resulting from SmUD.

A cross-sectional study conducted among 395 undergraduate medical students at Government Medical College (GMC), Haldwani, investigated smartphone addiction and its impact on quality of life (QOL) using the Smartphone Addiction Scale (SAS-SV) and WHO-BREF questionnaires. The study found that 42% of students considered themselves addicted to smartphones, with 43.8% classified as addicted based on SAS-SV criteria. Significant findings included lower addiction rates among the youngest and oldest student cohorts ($p < 0.001$) and higher addiction rates among male students compared to females (OR = 1.45, CI = 0.962–2.174). Additionally, smartphone addiction was shown to negatively affect QOL in all assessed domains, with p-values ranging from < 0.001 to 0.002. These results underscore the prevalence of smartphone addiction among medical students and its detrimental impact on their QOL, particularly among male students. The study recommends counselling on prudent smartphone use and suggests further research and intervention strategies to address this growing issue.

An exploratory study was conducted to assess the psychological mechanisms behind smartphone addiction among international students in China by utilizing the I-PACE (interaction of person-affect-cognition-execution) model. The study identified that these students are particularly susceptible to smartphone addiction due to a combination of personal factors such as neurotic personality traits, affective factors including loneliness, depression, and low self-esteem, and cognitive factors like passive

coping strategies and perceived stress. The addiction adversely impacts their academic performance and mental and physical health. The findings suggest that educational institutions should guide students in the rational and scientific use of smartphones to improve their well-being and social adaptability, and those policymakers should develop preventive strategies to mitigate this growing issue among the student population.

A comprehensive study conducted with the aim, to assess the extent of smartphone addiction among adolescents and its impact on their physical and mental health. The study revealed that smartphone addiction in adolescents can lead to significant health issues, highlighting the urgent need for intervention. The research outcomes serve as a crucial foundation for developing targeted measures to address the risks associated with excessive mobile phone use. These measures include activities designed to prevent and reduce the risks of smartphone addiction, thereby managing factors that contribute to risky behaviors in students. The findings emphasize the importance of implementing increased prevention efforts within school environments to tackle online risk behaviors effectively. The study provide valuable insights for educators, policymakers, and mental health professionals working to mitigate the adverse effects of smartphone addiction in the younger population.

A study was conducted to investigate the relationship between smartphone use and health symptoms among university students. Assessed sample of undergraduate students and found that increased smartphone use was significantly associated with a higher prevalence of health issues. Specifically, the study revealed that 72% of participants reported experiencing musculoskeletal symptoms due to prolonged smartphone use, and 67% reported suffering from sleep disturbances. These findings underscore the potential negative impact of excessive smartphone usage on the physical health of undergraduate university students.

A systematic review was conducted to explore the relationship between problematic smartphone use and mental health issues, particularly anxiety and depression, among university students. Their analysis revealed a significant correlation between problematic smartphone use and heightened levels of anxiety and depression among undergraduate students. Specifically, they found that 55% of participants exhibited symptoms of anxiety, while 48% showed signs of depression. These findings highlight the importance of addressing problematic smartphone use as a potential risk factor for mental health issues in this demographic.

A study was conducted to explore the association between smartphone use and physical activity levels among medical students in Pakistan. Their research revealed a negative correlation between smartphone use and physical activity, indicating that increased smartphone usage was linked to decreased physical activity levels among undergraduate university students. These findings underscore the potential impact of smartphone use on sedentary behaviors and highlight the importance of promoting physical activity among students to mitigate the adverse effects of excessive smartphone usage.

A study was carried out to investigate the impact of mobile phone use on physical activity and sedentary behavior among university students. Their findings revealed a significant negative relationship between smartphone use and physical activity levels, with higher smartphone usage associated with increased sedentary behavior among undergraduate students. This highlights the need for interventions aimed at reducing sedentary behaviors and promoting physical activity to improve the overall health and well-being of university students.

A comparative cross-sectional study was carried out to investigate the prevalence and risk factors of text neck syndrome among university students. Their research involved 1000 university students and found that 67% of participants reported experiencing symptoms of text neck syndrome. Additionally, the study identified smartphone usage as a significant risk factor, with 78% of students using smartphones for more than 4 hours per day reporting symptoms of text neck syndrome. These findings highlight the prevalence of text neck syndrome among university students and underscore the impact of excessive smartphone usage on musculoskeletal health.

A cross-sectional study was conducted to investigate the prevalence and risk factors of neck pain among university students. Their research involved 420 university students and found that 38% of participants reported experiencing neck pain. Additionally, the study identified smartphone usage as a significant risk factor, with 72% of students who used smartphones for more than 5 hours per day reporting neck pain. These findings emphasize the prevalence of neck pain among university students and highlight the association between smartphone usage and musculoskeletal issues.

A cross-sectional study was conducted to examine the prevalence of text neck syndrome among young adults aged 18 to 21 years. Their research involved 150 young adults and found that 70% of participants reported experiencing symptoms of text neck syndrome. Additionally, the study identified smartphone usage as a significant risk

factor, with 85% of participants who used smartphones for more than 4 hours per day reporting symptoms of text neck syndrome. These findings underscore the prevalence of text neck syndrome among young adults and highlight the impact of excessive smartphone usage on musculoskeletal health.

A study was carried out involving 1,000 university students in India to assess the impact of smartphone usage on depression and anxiety. The study found that 60% of the participants reported high levels of smartphone use, and among these, 45% exhibited symptoms of depression and 40% showed signs of anxiety. The study utilized the Beck Depression Inventory (BDI) and the Generalized Anxiety Disorder (GAD-7) scale. Statistical analysis revealed a strong positive correlation ($r = 0.58$, $p < 0.01$) between smartphone usage and depression, and a moderate positive correlation ($r = 0.45$, $p < 0.01$) between smartphone usage and anxiety. The results indicate a significant association between excessive smartphone use and mood disorders among Indian university students.

A study was conducted to determine relationship between smartphone addiction and mood disorders, including depression and anxiety, among 850 college students in India. The study found that 65% of participants were categorized as smartphone addicts based on the Smartphone Addiction Scale (SAS). Among these addicts, 50% exhibited moderate to severe depression as measured by the Patient Health Questionnaire-9 (PHQ-9), and 47% showed moderate to severe anxiety levels according to the GAD-7 scale. The study highlighted that smartphone addiction is significantly associated with increased levels of depression and anxiety among Indian college students.

A cross-sectional study was carried out with 1,200 university students in India to investigate the effects of excessive smartphone use on mental health, focusing on depression and anxiety. The study found that 70% of students reported excessive smartphone use, with 48% of these students experiencing depression and 43% experiencing anxiety. Using the Depression Anxiety Stress Scales (DASS-21), the study found a significant positive correlation between smartphone use and both depression ($r = 0.62$, $p < 0.001$) and anxiety ($r = 0.54$, $p < 0.001$). The results suggest that high smartphone usage is linked to increased risk of depression and anxiety among Indian students.

An exploratory carried to determine the relationship between smartphone use and mental health issues, particularly depression and anxiety, among 900 university students in India. The study found that 68% of participants were heavy smartphone

users, with 46% of these users displaying symptoms of depression and 42% showing symptoms of anxiety, as measured by the PHQ-9 and GAD-7 scales. The study demonstrated a strong positive correlation between heavy smartphone use and depression ($r = 0.59$, $p < 0.01$) and anxiety ($r = 0.50$, $p < 0.01$). The findings highlight the mental health risks associated with excessive smartphone use among Indian students (Reddy & Rao, 2020).

A study was conducted with 1,000 college students in India to assess the impact of smartphone usage on depression and anxiety levels in India. The study found that 62% of students were classified as heavy smartphone users. Among these, 44% exhibited significant levels of depression and 41% showed high levels of anxiety, based on the BDI and GAD-7 scales. Statistical analysis revealed significant positive correlations between smartphone usage and depression ($r = 0.55$, $p < 0.01$) and anxiety ($r = 0.47$, $p < 0.01$). The results underscore the link between excessive smartphone use and elevated depression and anxiety levels among Indian college students (Gupta & Verma, 2018).

2.1 Theoretical framework

The Health Belief Model (Rosenstock, 1974) is applied to explore how engineering students perceive the health risks associated with excessive smartphone use and their readiness to adopt healthier habits. The HBM components include:

- **Perceived Susceptibility**: Students' awareness of their vulnerability to physical issues like musculoskeletal strain and mental health challenges like anxiety and sleep disturbances.
- **Perceived Severity**: The degree to which students believe these health risks can significantly impact their academic performance and overall well-being.
- **Perceived Benefits**: Understanding the advantages of reducing screen time, such as improved posture, better sleep quality, and enhanced mental health.
- **Perceived Barriers**: Challenges faced in limiting smartphone use, such as dependence on devices for academic and social purposes.
- **Cues to Action**: Triggers that encourage behavior change, such as awareness campaigns or feedback from health professionals.
- **Self-Efficacy**: Students' confidence in their ability to regulate smartphone use and adopt healthier behaviors.

By applying the HBM, the study identifies key factors that influence students' behavioral decisions regarding smartphone use and proposes strategies to enhance their health awareness and self-regulation.

3. Methodology

Research methodology systematic way of solve the research problem. Methodological research studies are investigations of the ways of obtaining and organizing data and conducting rigorous research. Also address the development, validation and evaluation of research tools or method.

- **Research Design** : Descriptive design
- **Research approach** : A quantitative approach
- **Population** : Engineering undergraduate students
- **Sample** : Final year engineering undergraduate students
- **Sample size** : 600 engineering students

The sample size is calculated using following Formula

$$n = \frac{z^2 pq}{d^2}$$

Source: Lwanga SK, Lameshaw S. Sample size determination in health studies. WHO, Geneava, 1991.

Where:

n= sample size.

Z^2= value for the selected alpha level (1.96 at 95% confidence level)

d= desired level of precision (4%)

p= Prevalance of Smart phone addiction in students was **47%.**

Ref: karangiya J P et al (2022)

q=1-p , q=1-0.47, q= 0.53

Formula

$$n = \frac{z^2 pq}{d^2}$$

$$n = \frac{1.96^2 (0.47)(0.53)}{0.04 * 0.04}$$

$$n = \frac{0.961}{0.0016}$$

n =600

So in present study sample size comprise of 600 students.

- **Sampling technique**: Stratified random sampling technique
- **Criteria for Sample Selection**
  - **Inclusion criteria**

- Final year engineering students of engineering colleges.
- Engineering colleges of Marathwada region.
- Engineering students who can able to read and write English/ Marathi

- **Exclusion criteria**
  - Engineering students who are not willing to participate in the study
  - Engineering students who are not available during data collection

- **Setting of the Study:**

The present study was conducted at various engineering colleges of Marathwada region, which met inclusion criteria of the study. The study was conducted at engineering colleges of four districts of Marathwada region – Chhatrapati Sambhajinagar, Dharashiv, Jalna, Nanded.

- **Tools:**

Section A: Demographic characteristics

Section B: Smartphone Addiction Scale – Short Version

Section C: Impact of smartphone on physical health

Section D: Impact of smartphone on mental health

3.1 Data collection

Data collection is the precise systematic gathering of information relevant to the research purpose, specific objectives, questions or hypothesis of the study.

- ***Validity:*** The prepared instruments along with the objectives, operational definitions were submitted to experts to establish content validity. Suggestions of the experts considered and changes were made accordingly.
- **Reliability:** Reliability of the tool was assessed by using split half method.

  Section B: Smartphone addiction scale - Short Version (SV) r=0.792

  Section D: Mental Health r=0.860

  hence the tool was considered to be reliable.

  Pilot study: Pilot study was conducted on 60 participants. Participants were chosen based on criteria. The purpose of the pilot study was explained and informed consent obtained. Tool was administered to participants by using self administered questionnaire. It concludes that, the tool is reliable, feasible.

3.2 Data analysis & interpretation

Statistical analysis is a systematic alignment and synthesis of data by using this information. The attained information is examined in terms of objectives of the research by applying descriptive and inferential statistics. The data analysis plan is as follows:

- Organization of information in a master sheet
- Analysis of demographic data by frequency and percentage.
- Frequency and percentage applied to assess the level of smartphone usage, impact of smartphone usage on physical and mental health.
- Karl pearson correlation is applied to determine correlation between smartphone addiction score and level of mental health.
- Chi – square test is used to determine the significant association between smartphone addiction score, mental health and socio demographic variables.

4. Findings & Discussion

Findings of the study:

The present study aimed to assess the use of smartphone among the undergraduate students of the Marathwada region and its impact on their health. This study was conducted on 600 engineering students of Marathwada region. Analysis and interpretation of the study is based on the objectives of the study.

Organization of findings

The data collected from the engineering students been organised and presented under the following headings:

Section I: Analysis of frequency and percentage distribution of the demographic variables.

Section II: Assessment of smartphone addiction among engineering students.

Section III: Assessment of impact of smartphone on physical health among engineering students.

Section IV: Assessment of impact of smartphone on mental health among engineering students.

Section V: Correlation between mental health and smart phone addiction level among engineering students.

Section VI: Determine the association between the level smartphone addiction and selected socio-demographic variables.

Section VII: Determine the association between the level mental health and selected socio-demographic variables.

Section I: Analysis of frequency and percentage distribution of the demographic variables.

Table 1: Frequency and percentage distribution of engineering students based on demographic variables

N = 600

Particulars		**Frequency**	**Percentage**
Age (In Years)	a. 20 – 22	440	73.3
	b. 22-24	160	26.7
Gender	a. Male	335	55.8
	b. Female	265	44.2
Type of Family	a. Nuclear	274	45.7
	b. Joint	294	49.0
	c. Joint extended	32	5.3
Area of residence	a. Living with parents/guardian	309	51.5
	b. University hostel	147	24.5
	c. Off campus (alone)	56	9.3
	d. Off campus (with others)	88	14.7
Mobile usage since	a. Less than a year	15	2.5
	b. 1 – 2 years	60	10.0
	c. 2-3 years	129	21.5
	d. More than 3 years	396	66.0
Type of Cell Phone (Smartphone)	a. Android	587	97.8
	b. I phone	5	0.8
	c. Other	8	1.3
smart phone usage per day (in hrs)	a. Less than 2 hrs	90	15.0
	b. 2 hrs – 4 hrs	264	44.0
	c. 4 hrs – 6hrs	162	27.0
	d. More than 6 hrs	84	14.0
Purpose of Smartphone use	a. Communication	489	81.5
	b. Entertainment	407	67.8
	c. Education	472	78.7
	d. Social media	439	73.2
	e. Online shopping	319	53.2
	f. Gaming	264	44.0
	g. Making videos and taking selfies	183	30.5
	h. Others	97	16.7
	a. To update knowledge and skills	203	43.0

If it is for education, reason (n = 472)	b. Because not understand the classes	193	40.9
	c. Because not attending classes	76	16.1
Length of time using social media (Years)	a. Less than 1 year	118	19.7
	b. 1 – 3 years	308	51.3
	c. 3 – 6 years	135	22.5
	d. More than 6 years	39	6.5
Uses of social media applications	a. Face book	225	37.5
	b. Twitter	101	16.8
	c. Instagram	457	76.2
	d. LinkedIn	386	64.3
	e. YouTube	519	86.5
	f. Snapchat	390	65.0
	g. WhatsApp	526	88.2
	h. Telegram	493	82.2
Frequency of checking social media notifications	a. As soon as notification comes	108	18.0
	b. At every spare moment	121	20.2
	c. Several times a day	301	50.2
	d. Once every few days	70	11.7
Where the smartphone was placed while asleep	a. Under pillow/beside bed	159	26.5
	b. Away from bed	400	66.7
	c. In another room	41	6.8
Average money spent on your smartphone per month (In rupees)	a. Less than 200	147	24.5
	b. 201 – 400	365	60.8
	c. 401 – 600	53	8.8
	d. 601 & above	35	5.8
Sleeping hours per day	a. Less than 6 hrs	53	8.8
	b. 6 - 8 hrs	420	70.0
	c. 8 – 10 hrs	120	20.0
	d. More than 10 hrs	7	1.2

Age: In present study out of 600 participants, majority of participants 440(73.3%) were from age-group of 20-22 years and 160(26.7%) of participants from age-group 22-24 years. The mean age of participants was 21.79±1.82 years.

Gender: Majority of participants 335(55.8%) were male and 265(44.2%) of participants were female.

Type of family: Majority of participants 294(49.0%) were belongs to Joint family, 274(45.7%) participants belongs to Nuclear family and 32(5.3%) of participants were Joint extended family.

Area of residence: majority of participants 309(51.5%) were living with parents/guardian, followed by 147(24.5%) participants living in university/college hostel, 88(14.7%) were living at Off campus (with others) and 56(9.3%) were living at Off campus (alone).

Mobile usage since: Majority of participants 396(66.0%) were using mobile since more than 3 years, followed by 129(21.5%) participants were using mobile since 2-3 years, 60(10.0%) participants were using mobile since 1-2 years and 15(2.5%) participants were using mobile less than a year.

Type of Smartphone: Majority of participants 587(97.8%) were using Android, followed by 8(1.3%) participants were using mobile I phone and 5(0.8%) participants were using other cell phone.

Smartphone usage per day: Majority 264(44.0%) participants smart phone usage per day was 2 hrs – 4 hrs, followed by 162(27.0%) participants smart phone usage per day was 4 hrs – 6 hrs, 90(15.0%) participants smart phone usage per day was less than 2 hrs and 84(14.0%) participants smart phone usage per day was more than 6 hrs.

Purpose of smartphone usage: Majority of participants, 489(81.5%) were using smartphone for communication, followed by education 472(78.7%), Social media 439(73.2%), Entertainment 407(67.8%), Online shopping 319(53.2%), gaming 264(44.0%), making videos and taking selfies 183(30.5%) and 97(16.7%) of participants using smartphone for other purpose.

Smartphone use for education purpose & its reason: 472 participants using smartphone for purpose of education out of which 203(43.0%) participants were using smartphone for updating knowledge and skills, 193(40.9%) using smart phone for education because not understanding the classes and 76(16.1%) using smart phone for education because not attending classes.

Length of time using social media: In this study, 308(51.3%) of participants using social media from 1-3 years followed by 135(22.5%) of participants using social media from 3-6 years, 118(19.7%) and 39(6.5%) of participants using social media from less than 1 year and more than 6 years respectively.

Use of social media applications: Majority of participants, 526(88.2%) were using WhatsApp, followed by YouTube 519(86.5%), Telegram 493(82.2%), Instagram 457(76.2%), Snapchat 390(65.0%), LinkedIn 386(64.3%), Face book 225(37.5%) and 101(16.8%) of participants using Twitter.

Frequency of checking social media notifications: Majority 301(50.2%) participants checking social media notifications several times a day, followed by 121(20.2%) participants

checking social media notifications at every spare moment, 108(18.0%) as soon as notification comes and 70(11.7%) participants checking social media notifications once every few days.

Placement of smartphone while sleep: Majority of participants, 400(66.7%) were placed their smartphone way from bed, 159 (26.5%) were placed their smartphone under pillow/beside bed and 41(6.8%) of participants placed their smartphone in another room while asleep.

Average money spent on participants smartphone per month (In rupees): Majority of participants, 365(60.8%) were averagely spent 201-400 rupees money on smartphone per month, followed by 147 (24.5%) participants averagely spent less than 200 rupees money on smartphone per month, 53(88%) and 35(5.8%) were averagely spent 401 – 600 rupees and rupees 601 & above money on smartphone per month.

Sleeping hours per day: majority of participants 420(70.0%) were sleeping 6-8 hours per day, followed by 120(20.0%) of participants sleeping 8-10 hours per day, 53(8.8%) of participants sleeping less than 6 hours per day and 7(1.2%) participants sleeping more than 10 hours.

Section II: Assessment of smartphone addiction among engineering students.

Table 2: Distribution of participants according to Addition of Mobile

N = 600

Smartphone addiction scale – short version score	**No. of participants**	**Percenatge**
No addiction (≤22)	252	42.0
Potential addiction (>22)	348	58.0
Total	600	100.0
Mean±SD	26.41±11.01	

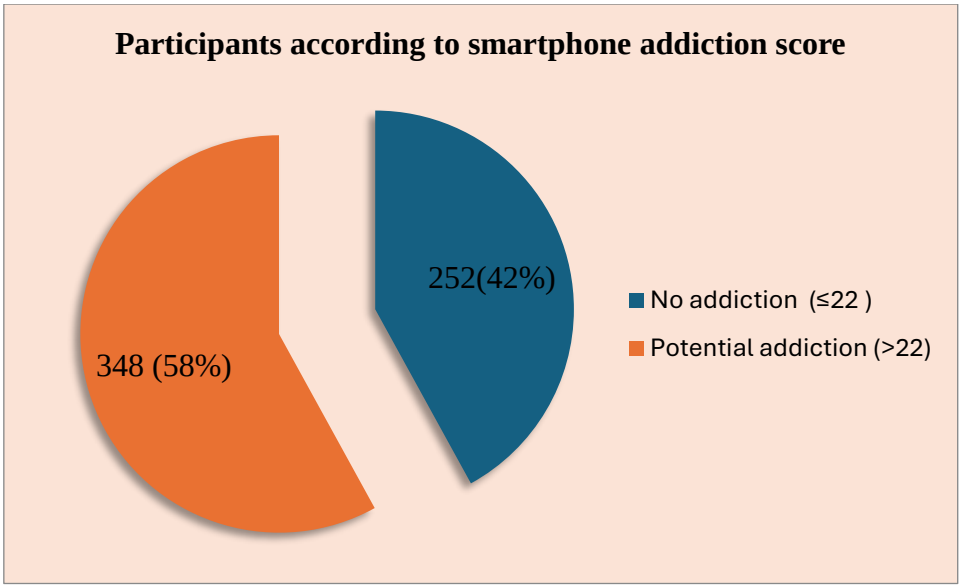

Fig. 1. Level of smartphone addiction score

Table 2 and fig 1 depicts that, out of 600 participants, majority of 348(58.0%) of participants were having potential addiction of smartphone and 252(42.0%) of participants were not having addiction of smartphone. The mean addiction score was 26.41±11.01. Hence null hypothesis H_{01} is rejected.

Section III: Assessment of impact of smartphone on physical health among engineering students.

Table 3: Distribution of participants according to impact of smartphone on physical health variables

Sr. No	Physical Variables	Yes	No	Sometimes
1.	Eye strain	112(18.7%)	268 (44.7%)	220(36.7%)
	Watery eyes	106(17.7%)	319 (53.2%)	175(29.2%)
	Dryness of eyes	89(14.8%)	387 (64.5%)	124(20.7%)
	Burning eyes after mobile usage	115(19.2%)	325 (54.7%)	160(26.7%)
	Wears spectacle after mobile usage	111(18.5%)	78 (13.0%)	411(68.5%)
2.	Neck pain	111(18.5%)	348 (58.0%)	141(23.5%)
3.	Headache	123(20.5%)	296 (49.3%)	181(30.2%)
4.	Pain in hands	75(12.5%)	407 (67.8%)	118(18.7%)
5.	Sleep disturbance	144(24.0%)	326 (54.3%)	130(21.7%)
6.	Feeling of exhaustion	122(20.3%)	349(58.2%)	129(21.5%)

Table 3 interprets that, 112(18.7%) of participants had eye strain, 220(36.7%) of participants reported sometimes eye strain and 268 (44.7%) participants not complained eye strain. 106(17.7%) of participants were complained watery eyes and 175(29.2%) participants complained sometime watery eyes. About 89(14.8%) of participants were complained dryness of eyes and 124(20.7%) of participants complained sometime dryness in their eyes. The burning eyes after mobile usage was complained by 115(19.2%) participants and 160(26.7%) of participants complained sometime burning eyes after mobile usage. About 111(18.5%) of participants were wears spectacle after mobile usage and majority of 411(68.5%) of participants were wears spectacle after mobile usage.

Participants were complained for neck pain in 111(18.5%), headache 123(20.5%), pain in hands 75(12.5%), Sleep disturbance 144(24.0%) and feeling of exhaustion in 122(20.3%).
Hence null hypothesis H_{02} is rejected.

Section IV: Assessment of impact of smartphone on mental health among engineering students.

Table 4: Distribution of participants according to impact of smartphone on mental health

N=600

Mental Health	No. of participants	Percenatge
Poor Mental Health (45 – 90)	414	69.0
Good Mental Health (18 – 44)	186	31.0
Total	600	100%
Mean±SD	52.52±15.45	

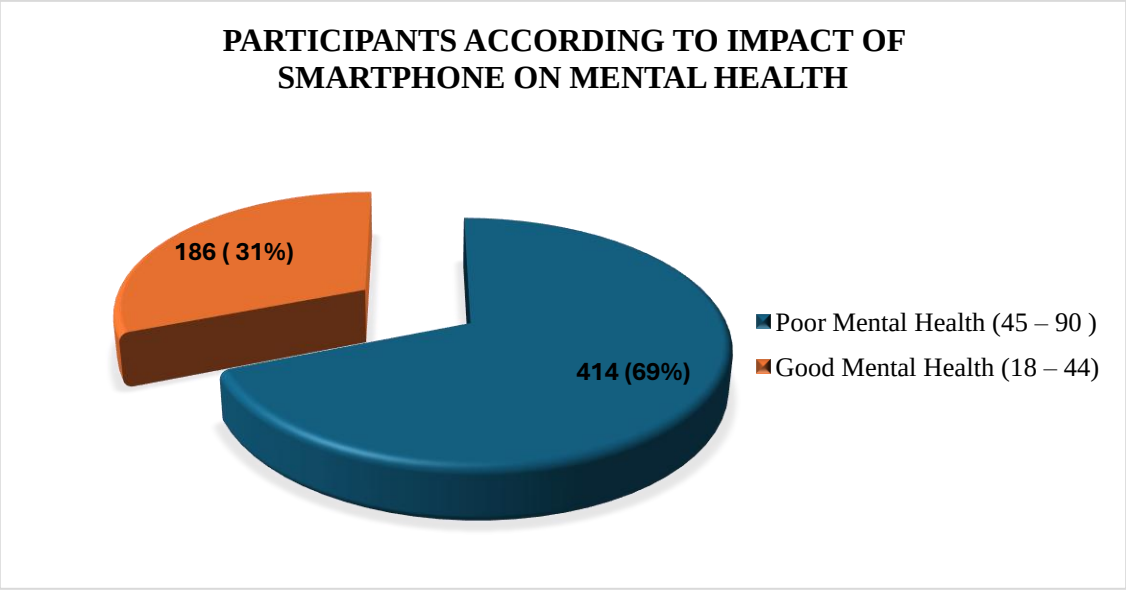
PARTICIPANTS ACCORDING TO IMPACT OF SMARTPHONE ON MENTAL HEALTH
186 (31%)
414 (69%)
Poor Mental Health (45 – 90)
Good Mental Health (18 – 44)

Fig. 2. Distribution of participants according to impact of smartphone on mental health

Table 4 & fig 2 interprets that, out of 600 participants, majority of 414(69.0%) of participants were found poor mental health and 186(31.0%) of participants were found good mental health score. The mean addiction score was 52.52±15.45. Hence null hypothesis H_{03} is rejected.

Section V: Correlation between mental health and smart phone addiction level among engineering students.

Table 5: Correlation between Mental Health Score and Smartphone Addiction score

N=600

Correlation	r-value	p-value
Mental Health Vs Smartphone Addiction scale score	**0.345**	**P<0.0001 S**

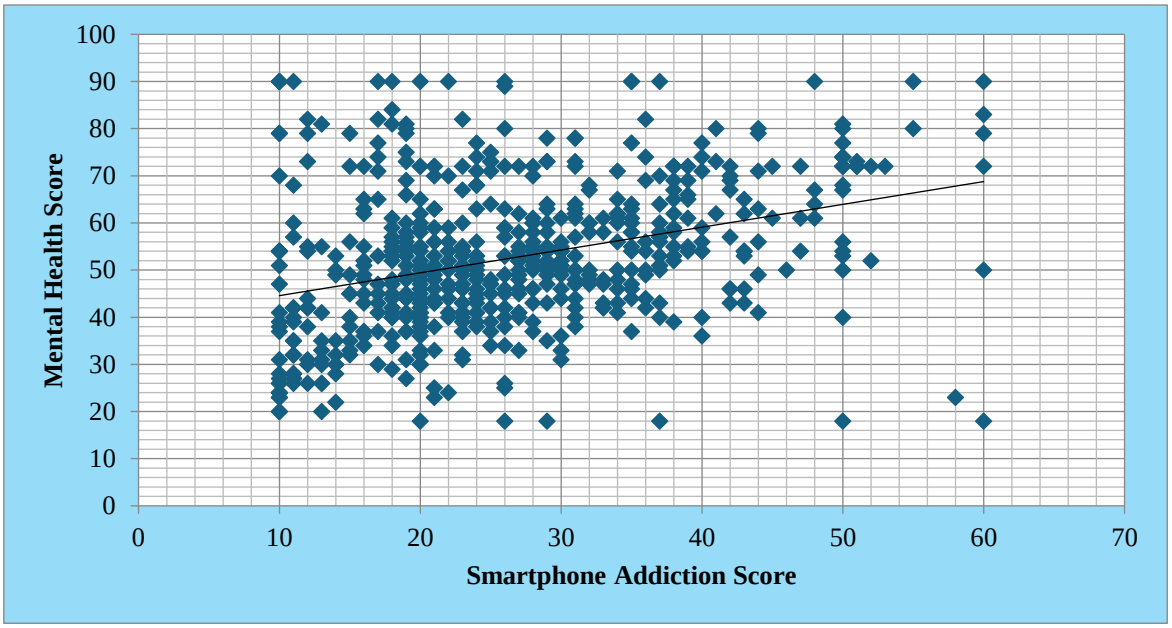

Fig 3: Relationship between Mental Health Score and Smartphone Addiction score.

Table 5 & fig. 3 indicates there was positive correlation (r=0.345) between mental health Score and Smartphone addiction score among participants. This relationship was found to be statistically significant (p<0.0001). Hence null hypothesis H_{04} is rejected.

Section VI: Determine the association between the level smartphone addiction and selected socio-demographic variables.

Table 6: Association between Smartphone addiction score Classification and demographic profile

N=600

Particulars		**Smartphone addiction score Classification**			**Chi-square value**	**p-value**
		No addiction (≤22) [n=252]	**Potential addiction (>22) [n=348]**	**Total [n=600]**		
Age-group	20 – 22	188	252	440	0.358	P=0.549 NS
	22-24	64	96	160		
Gender	Male	137	198	335	1.12	P=0.294 NS
	Female	115	150	265		
Type of Family	Nuclear	117	157	274	0.324	P=0.850 NS
	Joint	123	171	294		
	Joint extended	12	20	32		
Area of residence	Living with parents/guardian	171	138	309	8.79	P=0.002 S
	University hostel	34	113	147		
	Off campus (alone)	15	41	56		
	Off campus (with others)	32	56	88		
Sleeping hours per day	Less than 6 hrs	12	41	53	5.12	P=0.043 S
	6 - 8 hrs	166	254	420		
	8 – 10 hrs	69	51	120		
	More than 10 hrs	5	2	7		

There was no statistical significant association between Smartphone addiction score classification and age-group (p=0.549), Gender (p=0.294) & Type of Family (p=0.850). There was statistical significant association between Smartphone addiction score classification and

area of residence (p=0.002), Sleeping hours per day (p=0.043). Hence null hypothesis H_{05} is rejected.

Table 7: Association between Smartphone addiction score Classification and Smartphone usage

N=600

Particulars		**Smartphone addiction score Classification**			**Chi-square value**	**p-value**
		No addiction (≤22) [n=252]	**Potential addiction(>22) [n=348]**	**Total [n=600]**		
Type of Cell Phone	Android	244	343	587	1.29	P=0.681 NS
	I phone	3	2	5		
	Others	5	3	8		
Mobile usage since	Less than a year	6	9	15	3.82	P=0.211 NS
	1 – 2 years	34	26	60		
	2-3 years	51	78	129		
	More than 3 years	161	235	396		
Purpose of Smartphone use	Communication	184	305	489	38.93	P<0.0001 S
	Entertainment	163	244	407	23.21	P<0.0001 S
	Social media	169	303	472	19.22	P<0.0001 S
	Online shopping	171	268	439	14.29	P<0.0001 S
	Gaming	109	210	319	17.21	P<0.0001 S
	Making videos and taking selfies	102	162	264	1.72	P=0.189 NS
	Education	83	100	183	4.01	P=0.056 NS
	Others	47	50	97	1.29	P=0.723 NS
Where the smartphone was placed while asleep	Under pillow/beside bed	60	99	159	1.76	P=0.415 NS
	Away from bed	173	227	400		
	In another room	19	22	41		

Average money spent on your smartphone per month (In rupees)	Less than 200	74	83	147	7.35	P=0.042 S
	201 – 400	153	212	365		
	401 – 600	16	37	53		
	601 & above	09	26	35		

There was not statistical significant association between Smartphone addiction score classification and Type of Cell Phone (p=0.681), Mobile usage since (p=0.211), & Where the smartphone was placed while asleep (p=0.415).

Whereas statistical significant association found between Smartphone addiction score classification and average money spent on your smartphone per month (In rupees) (p=0.042).

There was statistical significant association between Smartphone addiction score classification and purpose of smartphone use i.e. Communication (P<0.0001), entertainment (P<0.0001), Social media (P<0.0001), Online shopping (P<0.0001), Gaming (P<0.0001). Whereas there was no statistical significant association between Smartphone addiction score classification and purpose of smartphone use i.e. Making videos and taking selfies (P=0.189), Education (P=0.056) and others purpose (P=0.723). Hence null hypothesis H_{05} is rejected.

Table 8: Association between Smartphone addiction score Classification and Smartphone usage

N=600

Particulars		**Smartphone addiction score Classification**			**Chi-square value**	**p-value**
		No addiction (≤22) [n=252]	**Potential addiction(>22) [n=348]**	**Total [n=600]**		
Length of time using social media (Years)	Less than 1 year	53	65	118	1.85	P=0.603 NS
	1 – 3 years	133	175	308		
	3 – 6 years	52	83	135		
	More than 6 years	14	25	39		
Uses of social media applications	Face book	66	159	225	18.56	P<0.0001S
	Twitter	49	52	101	2.11	P=0.145 NS
	Instagram	167	291	457	14.90	P<0.0001S

	LinkedIn	187	201	386	0.7930	P=0.372 NS
	YouTube	201	318	519	12.84	P<0.0001S
	Snapchat	151	239	390	4.87	P=0.021 S
	WhatsApp	201	325	526	25.12	P<0.0001S
	Telegram	200	293	493	2.33	P=0.127 NS
Frequency of checking social media notifications	As soon as notification comes	40	68	108	8.64	P=0.036 S
	At every spare moment	45	76	121		
	Several times a day	126	175	301		
	Once every few days	41	29	70		
smart phone usage per day (in hrs)	Less than 2 hrs	46	44	90	8.18	P=0.034 S
	2 hrs – 4 hrs	120	144	264		
	4 hrs – 6hrs	62	100	162		
	More than 6 hrs	24	60	84		

There was no statistical significant association between smartphone addiction score classification and Length of time using social media (years) (p=0.603).

There was statistical significant association between smartphone addiction score classification and frequency of checking social media notifications (p=0.036) and smart phone usage per day (in hrs) (p=0.034).

There was statistical significant association between Smartphone addiction score classification and Uses of social media applications i.e. Face book (P<0.0001), Instagram (P<0.0001), YouTube (P<0.0001), Snapchat (P<0.0001), WhatsApp (P<0.0001). Whereas There was not statistical significant association between Smartphone addiction score classification and Uses of social media applications i.e. Twitter (P=0.145), LinkedIn (P=0.372) and Telegram (P=0.127).

Hence null hypothesis H_{05} is rejected.

Section VII: Determine the association between the level mental health and selected socio-demographic variables.

Table 9: Association between Mental Health score Classification and demographic profile

N=600

Particulars		Mental Health score Classification			Chi-square value	p-value
		Poor Mental Health (45 – 90) [n=414]	Good Mental Health (18 – 44) [n=186]	Total [n=600]		
Age-group	20 – 22	300	140	440	0.516	P=0.472 NS
	22-24	114	46	160		
Gender	Male	234	101	335	0.257	P=0.612 NS
	Female	180	85	265		
Type of Family	Nuclear	185	89	274	5.65	P=0.045 S
	Joint	201	93	294		
	Joint extended	28	4	32		
Area of residence	Living with parents/guardian	196	113	309	8.79	P=0.002 S
	University hostel	98	49	147		
	Off campus (alone)	47	09	56		
	Off campus (with others)	73	15	88		
Sleeping hours per day	Less than 6 hrs	44	9	53	7.12	P=0.023 S
	6 - 8 hrs	286	134	420		
	8 – 10 hrs	79	41	120		
	More than 10 hrs	2	5	7		

There was no statistical significant association between mental health score classification and age-group (p=0.472), Gender (p=0.612).

There was statistical significant association between mental health score classification and Type of Family (p=0.045), area of residence (p=0.002), Sleeping hours per day (p=0.023).

Hence null hypothesis H_{05} is rejected.

Table 10: Association between Mental Health score Classification and Smartphone use

N=600

Particulars		Mental Health score Classification			Chi-square value	p-value
		Poor Mental Health (45 – 90) [n=414]	Good Mental Health (18 – 44) [n=186]	Total [n=600]		
Type of Cell Phone	Android	404	183	587	1.49	P=0.478 NS
	I phone	3	2	5		
	Others	7	1	8		
Mobile usage since	Less than a year	11	4	15	1.62	P=0.653 NS
	1 – 2 years	38	22	60		
	2-3 years	93	36	129		
	More than 3 years	272	124	396		
Purpose of Smartphone use	Communication	385	104	489	32.55	P<0.0001 S
	Entertainment	364	83	407	28.76	P<0.0001 S
	Social media	383	89	472	22.63	P<0.0001 S
	Online shopping	370	69	439	16.72	P<0.0001 S
	Gaming	262	57	319	18,21	P<0.0001 S
	Making videos and taking selfies	193	71	264	11.83	P=0.004 S
	Education	115	67	183	2.89	P=0.317 NS
	Others	52	45	97	1.17	P=0.693 NS
Where the smartphone was placed while asleep	Under pillow/beside bed	126	33	159	14.05	P=0.001 S
	Away from bed	256	144	400		
	In another room	32	9	41		
Average money spent on your	Less than 200	89	58	147	8.72	P=0.033 S
	201 – 400	258	107	365		
	401 – 600	38	15	53		

smartphone per month (In rupees)	601 & above	29	6	35		

There was no statistical significant association between mental health score classification and Type of Cell Phone (p=0.478) & Mobile usage since (p=0.653). Whereas there was statistical significant association between mental health score classification and average money spent on your smartphone per month (In rupees) (p=0.033) & Where the smartphone was placed while asleep (p=0.001).

There was statistical significant association between mental health score classification and purpose of smartphone use i.e. Communication (P<0.0001), entertainment (P<0.0001), Social media (P<0.0001), Online shopping (P<0.0001), Gaming (P<0.0001) & Making videos and taking selfies (P=0.004). Whereas There was no statistical significant association between mental health score classification and purpose of smartphone use i.e. Education (P=0.317) and others purpose (P=0.693).

Hence null hypothesis H_{05} is rejected.

Table 11: Association between Mental Health score Classification and Smartphone usage

N=600

Particulars		**Mental Health score Classification**			**Chi-square value**	**p-value**
		Poor Mental Health (45 – 90) [n=414]	**Good Mental Health (18 – 44) [n=186]**	**Total [n=600]**		
Length of time using social media (Years)	Less than 1 year	79	39	118	3.75	P=0.290 NS
	1 – 3 years	205	103	308		
	3 – 6 years	101	34	135		
	More than 6 years	29	10	39		
Uses of social media applications	Face book	198	27	225	29.41	P<0.0001S
	Twitter	67	34	101	1.94	P=0.309 NS
	Instagram	390	67	457	37.03	P<0.0001S
	LinkedIn	303	83	386	30.92	P<0.0001S
	YouTube	388	131	519	19.04	P<0.0001S

	Snapchat	319	71	390	31.47	P<0.0001S
	WhatsApp	385	141	526	22.29	P<0.0001S
	Telegram	390	103	493	14.90	P<0.0001S
Frequency of checking social media notifications	As soon as notification comes	86	22	108	12.34	P=0.006 S
	At every spare moment	75	46	121		
	Several times a day	212	89	301		
	Once every few days	41	29	70		
Smart phone usage per day (in hrs)	Less than 2 hrs	55	35	90	11.09	P=0.011 S
	2 hrs – 4 hrs	174	90	264		
	4 hrs – 6hrs	116	46	162		
	More than 6 hrs	69	15	84		

There was no statistical significant association between metal health score classification and length of time using social media (years) (p=0.290).

There was statistical significant association between metal health score classification and frequency of checking social media notifications (p=0.006) and smart phone usage per day (in hrs) (p=0.011).

There was statistical significant association between metal health score classification and Uses of social media applications i.e. Face book (P<0.0001), Instagram (P<0.0001), YouTube (P<0.0001), Snapchat (P<0.0001), WhatsApp (P<0.0001) LinkedIn (P<0.0001) and Telegram (P<0.0001). Whereas There was no statistical significant association between metal health score classification and Uses of social media applications i.e. Twitter (P=0.309).

Hence null hypothesis H_{05} is rejected.

Discussion

The research study findings have been discussed with relevance to the objectives and with other research study findings.

- In present study out of 600 participants, majority of participants 440(73.3%) were from age-group of 20-22 years, 335 (55.8%) were males, 294 (49%) belongs to joint family, 309 (51.5%) live with parents/guardians.

  Similarly cross-sectional study conducted to examine the prevalence of text neck syndrome among young adults aged 18 to 21 years. Their research involved 150

young adults and found that 70% of participants reported experiencing symptoms of text neck syndrome.

- In this research study majority of 348(58.0%) of participants were having potential addiction of smartphone and 252(42.0%) of participants were not having addiction of smartphone. The mean addiction score was 26.41±11.01.

  Similarly a cross-sectional study conducted among 395 undergraduate students at Government Medical College (GMC), Haldwani, investigated smartphone addiction and its impact on quality of life (QOL) using the Smartphone Addiction Scale (SAS-SV) and WHO-BREF questionnaires. The study found that 42% of students considered themselves addicted to smartphones, with 43.8% classified as addicted based on SAS-SV criteria.

  a cross-sectional survey was conducted among 692 engineering undergraduates from a top engineering university in China. Results depicts that, the rate of smartphone addiction was 63.58%, with 56.21% for women and 65.68% for men, among 692 engineering students.

- In this study, results depicted impact of smartphone use on physical health variables found that112(18.7%) of participants had eye strain, 106(17.7%) of participants were complained watery eyes, about 89(14.8%) of participants were complained dryness of eyes and 124(20.7%) of participants complained sometime dryness in their eyes. The burning eyes after mobile usage was complained by 115(19.2%) participants after mobile usage. Majority of 411(68.5%) of participants were wears spectacle after mobile usage. Participants complained of neck pain in 111(18.5%), headache 123(20.5%), pain in hands 75(12.5%), Sleep disturbance 144(24.0%) and feeling of exhaustion in 122(20.3%).

  Similarly a cross-sectional study was conducted to investigate the prevalence and risk factors of text neck syndrome among university students. Their research involved 1000 university students and found that 67% of participants reported experiencing symptoms of text neck syndrome.

  A cross-sectional study was conducted to investigate the prevalence and risk factors of neck pain among university students. Their research involved 420 university students and found that 38% of participants reported experiencing neck pain.

  A cross-sectional study explores the association between smartphone use and sleep disturbance among Chinese university students. Statistical analysis revealed a

significant correlation between smartphone use and sleep disturbance, with 70% of participants experiencing disrupted sleep patterns.

Similar study was conducted with the aim to investigate the prevalence of vision problems and eye strain related to smartphone usage and its impact on visual health in a pediatric population. Statistical analysis indicated a significant correlation between the duration of smartphone use and the severity of visual symptoms reported by children.

- In present study majority of 414(69.0%) of participants were found poor mental health and 186(31.0%) of participants were found good mental health score. The mean addiction score was 52.52±15.45.

Similarly a study explored the impact of smartphone usage on stress and coping mechanisms among 1,100 university students in India. The study found that 72% of students experienced significant stress due to high smartphone use, and 59% resorted to maladaptive coping mechanisms.

a study involved 1,200 university students in India to explore the impact of smartphone usage on memory and attention span. The study found that 65% of students reported significant memory issues and reduced attention spans associated with high smartphone use.

A study investigated the relationship between smartphone addiction and cognitive impairments, including memory and attention span, among 900 college students in India. The study found that 70% of participants exhibited signs of smartphone addiction, with 60% reporting memory issues and 55% experiencing reduced attention spans.

- In this research study, there was positive correlation (r=0.345) between mental health Score and Smartphone addiction score among participants. This relationship was found to be statistically significant ($p<0.0001$).

Similarly, a study involving 1,000 university students in India to explore the impact of smartphone usage on FOMO and anxiety. The study statistical analysis showed a significant positive correlation ($r = 0.58$, $p < 0.01$) between the amount of time spent on smartphones and FOMO levels, as well as between FOMO and anxiety levels ($r = 0.62$, $p < 0.01$).

A study involving 1,200 university students in India to explore the impact of smartphone usage on addiction and compulsive behaviors. The study found that a

significant positive correlation ($r = 0.56$, $p < 0.01$) between smartphone usage and compulsive behaviors.

The study results found that a significant positive correlation ($r = 0.55$, $p < 0.01$) between smartphone usage and stress

5. Recommendations

In view of the present study results following recommendations are presented for additional research.

1. Awareness campaigns on responsible smartphone use
    - initiate awareness programs to educate engineering students about the potential physical and mental health risks associated with excessive smartphone use.
2. Incorporation of digital wellbeing education in curriculum
    - Universities can integrate digital well-being education into their curriculum to encourage mindful use of smartphones
3. Implementation of digital detox programs.
    - Institutions can organize periodic digital detox programs to help students reduce smartphone dependency.
4. The study can be replicated on a huge scale of sample to authenticate and for better generalization of the findings.
5. The study can be conducted in various surroundings.

6. Conclusion:

This study concludes that, there is potential addiction of smartphone among engineering students of Marathwada engineering colleges. The impact of smartphone on physical health and mental health was noticed among engineering students. Positive correlation was evident between level of mental health and smartphone addiction among participants. There is need of awareness of smartphone addiction and its impact on physical and mental health among students.

7. Future research directions

The implications of smartphone use among engineering students on physical and mental health, the following future research directions are proposed:

- Conduct longitudinal studies to assess the long-term effects of smartphone use on students' health and academic performance.
- Implement controlled experimental studies to test the causality of relationships between smartphone use and health outcomes.

- Conduct in collaborative research with fields like psychology, public health to understand the multifaceted effects of smartphone use.
- Explore differences in smartphone usage and its impacts across genders and other demographic variables.
- Examine smartphone usage patterns and health impacts across various academic disciplines to determine whether engineering students face unique challenges.
- Investigate how policies at home and in educational institutions impact smartphone use.

References

1. Alghadir, A. H., Zafar, H., Iqbal, Z. A., & Al-Eisa, E. S. (2018). The prevalence and risk factors of text neck syndrome among university students: A comparative cross-sectional study. *BioMed Research International, 2018.* https://doi.org/10.1155/2018/3823852
2. Alkhateeb, A., Alboali, R., Alharbi, W., & Saleh, O. (2020). Smartphone addiction and its complications related to health and daily activities among university students in Saudi Arabia: A multicenter study. *Journal of Family Medicine and Primary Care, 9,* 3220-3224. https://doi.org/10.4103/jfmpc.jfmpc_701_20
3. Alshagga, M. A., Nimer, A. R., Yan, L. P., Ibrahim, I. A. A., & Al-Ghamdi, S. S. (2012). Prevalence and risk factors of neck pain among university students: A cross-sectional study. *BMC Public Health, 12*(1), 1-9. https://doi.org/10.1186/1471-2458-12-610
4. Awasthi, S., Kaur, A., Solanki, H. K., Pamei, G., & Bhatt, M. (2020). Smartphone use and the quality of life of medical students in the Kumaun region, Uttarakhand. *Journal of Family Medicine and Primary Care, 9*(8), 4252-4258. https://doi.org/10.4103/jfmpc.jfmpc_802_20
5. Elhai, J. D., Dvorak, R. D., Levine, J. C., & Hall, B. J. (2017). Problematic smartphone use: A conceptual overview and systematic review of relations with anxiety and depression psychopathology. *Journal of Affective Disorders, 207,* 251-259. https://doi.org/10.1016/j.jad.2016.08.030
6. Gao, W. J., Hu, Y., Ji, J. L., & Liu, X. Q. (2023). Relationship between depression, smartphone addiction, and sleep among Chinese engineering students during the COVID-19 pandemic. *World Journal of Psychiatry, 13*(6), 361-375. https://doi.org/10.5498/wjp.v13.i6.361
7. Gupta, A., & Verma, R. (2018). The impact of smartphone usage on depression and anxiety levels among Indian college students. *Indian Journal of Community Medicine, 43*(4), 300-305. https://doi.org/10.4103/ijcm.IJCM_198_18
8. Kim, S. Y., Koo, S. J., & Kwak, S. H. (2016). Text neck syndrome in 18- to 21-year-old young adults: A cross-sectional study. *Journal of Physical Therapy Science, 28*(6), 1669-1672. https://doi.org/10.1589/jpts.28.1669
9. Kumar, S., & Singh, P. (2019). Smartphone addiction and its relation to depression and anxiety in Indian college students. *Journal of Mental Health and Human Behavior, 24*(3), 245-251. https://doi.org/10.4103/jmhb.jmhb_66_19

10. Lepp, A., Barkley, J. E., & Karpinski, A. C. (2015). The relationship between cell phone use, academic performance, anxiety, and satisfaction with life in college students. *Computers in Human Behavior, 31,* 343-350. https://doi.org/10.1016/j.chb.2013.10.049
11. Lo, J., Ho, R., & Tam, W. (2021). The impact of mobile phone use on physical activity and sedentary behavior in university students. *International Journal of Environmental Research and Public Health, 18*(12), 6394. https://doi.org/10.3390/ijerph18126394
12. Mehmood, A., et al. (2021). Exploration of psychological mechanism of smartphone addiction among international students of China by selecting the framework of the I-PACE model. *Frontiers in Psychology, 12,* 758610. https://doi.org/10.3389/fpsyg.2021.758610
13. Patel, V., & Desai, P. (2021). Effects of excessive smartphone use on mental health: Depression and anxiety among Indian students. *Asian Journal of Psychiatry, 56,* 102540. https://doi.org/10.1016/j.ajp.2021.102540
14. Polit, F. D., & Beck, C. T. (2008). *Nursing research: Principles and methods* (8th ed.). Wolters Kluwer.
15. Reer, F., Wehden, L.-O., Janzik, R., & Quandt, T. (2022). Examining the interplay of smartphone use disorder, mental health, and physical symptoms. *Frontiers in Public Health, 10.* https://doi.org/10.3389/fpubh.2022.867258
16. Reddy, S., & Rao, K. (2020). Smartphone use and mental health: Examining depression and anxiety in Indian university students. *Indian Journal of Clinical Psychology, 47*(2), 179-185.
17. Shah, T., Ghaffar, U., & Jabeen, U. (2021). The association between smartphone use and physical activity level among medical students in Pakistan. *Cureus, 13*(3), e13969. https://doi.org/10.7759/cureus.13969
18. Sharma, R., & Choudhary, A. (2020). Impact of smartphone usage on depression and anxiety among university students in India. *Indian Journal of Psychiatry, 62*(5), 500-507. https://doi.org/10.4103/psychiatry.IndianJPsychiatry_1185_19
19. Thomée, S. (2018). Mobile phone use and mental health: A review of the research that takes a psychological perspective on exposure. *International Journal of Environmental Research and Public Health, 15*(12), 2692. https://doi.org/10.3390/ijerph15122692
20. Zošáková, K., Novocký, M., & Niklová, M. (2020). Smartphone addictive behaviour in adolescents. *Československá Psychologie, 62,* 24-33.